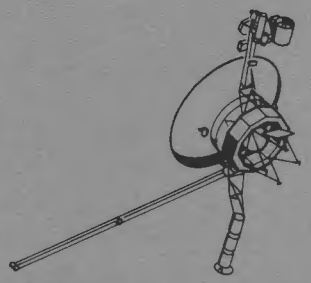

MISSION STATUS BULLETIN

VOYAGER

September 29, 1977 **No. 9**

SUMMARY

Twenty-four days after launch, Voyager 1 is 21 million kilometers (13 million miles) from Earth, cruising at a velocity of 35,470 kilometers (22,040 miles) per hour. One-way communication time with the spacecraft is 68 seconds. Science calibration and configuration commands are being uplinked during real-time command windows.

Voyager 2, now forty days into its journey towards Jupiter, Saturn, and possibly Uranus, is 33 million kilometers (20 million miles) from Earth, cruising at a velocity of 30,520 kilometers per hour. One-way communication time with the spacecraft is 1 minute 47 seconds. Science calibration and configuration commands are being uplinked during real-time command windows, and a tree switch (circuitry) failure in the flight data subsystem (FDS) is being analyzed.

UPDATE

VOYAGER 1

Trajectory Correction Maneuver

Voyager 1's first trajectory correction maneuver (TCM) was accomplished in two parts September 11 and 13; real-time data was received during the first of the thruster burns.

Analysis of the TCM data indicates a 20 percent undervelocity resulting from each part of the maneuver. The suspected cause is impingement of the thruster exhaust on spacecraft structural support struts. Part one of the maneuver increased the craft's velocity by 2.45 meters per second, the second by 10.11 meters per second. The ungained velocity will be compensated for during the next scheduled trajectory correction maneuver.

These periodic flight path adjustments are necessary to assure precise arrival times of the spacecraft at their objectives, to maximize science data return. In the case of Voyager 1, its exact arrival (closest approach) at Jupiter (March 5, 1979) is crucial to studying the interaction between Jupiter and its satellite Io.

Video Playback

Optical navigation data and an Earth-Moon video sequence recorded on September 18 will be played back on October 7 and 10, as currently scheduled. The playback sequence requires pointing the high-gain antenna toward Earth, and must be done in two parts to protect temperature-sensitive portions of the spacecraft from the colder temperatures of space, since some areas of the craft are temporarily shaded from the Sun's rays during the Earth-point maneuver.

The video sequence of the Earth-Moon system includes pictures taken at 18 different pointing positions, photographed with each of three color filters to allow construction of composite color photographs.

Science Instruments

The science instruments aboard Voyager 1 are in good health and operating as planned. The photopolarimeter data is being analyzed to better understand the nature of a high photon count indicating a bright light source in a position where none is known to exist.

VOYAGER 2

FDS Tree Switch

On September 23, Voyager 2 experienced a failure in the flight data subsystem (FDS) circuitry which has resulted in the loss of 15 of 243 engineering measurements which can be sent to Earth. The loss could be permanent if due to an integrated circuit failure, or possibly temporary if due to an electronic latch switching condition. Problem isolation is in progress, and an unlatching attempt is being designed.

Of the 15 measurements, several are duplicated in the remaining 228 measurements, a few can be deduced from combinations of other measurements, others were needed only during launch, and the remainder may have some effect on performance analysis of other subsystems aboard the spacecraft.

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Trajectory Correction Maneuver

Voyager 2's first trajectory correction maneuver is scheduled for October 11. Current estimates of the hydrazine fuel budget indicate there is sufficient fuel to support the mission through a Uranus encounter in 1986, despite the gas utilization problems to date.

Science Instruments

Science commands are being sent to Voyager 2 during regularly scheduled real-time command windows. Recent commands have included calibrations of the magnetometers and the fields and particles instruments. One of these magnetometer calibration sequences creates a magnetic field around the spacecraft by periodically powering a wire which runs the circumference of the high-gain antenna dish.

The photopolarimeter instrument has been turned off. After being freed once, the analyzer wheel is currently stuck again in a safe position, and the problem is being analyzed.

TRACKING AND DATA ACQUISITION

From the moment of launch, the Voyager spacecraft have been under constant surveillance by a world-wide tracking and data system which includes elements of the NASA/Jet Propulsion Laboratory Deep Space Network (DSN), the Air Force Eastern Test Range (AFETR), and the NASA Spaceflight Tracking and Data Network (STDN).

Near-Earth Facilities

From launch through the propulsion module burn which boosted the spacecraft into their Jupiter-bound trajectories, tracking and data acquisition was accomplished by the near-Earth facilities, including the AFETR stations downrange elements of the STDN, ARIA jets (Advanced Range Instrumented Aircraft), and a communications ship at sea, the U.S.N.S. Vanguard.

Tying together all NASA sites is the NASA Communications Network (NASCOM). Voice and data communications flow through its three million circuit miles of electronic circuitry and two mid-ocean satellites.

Deep Space Network

Tracking and communication with the Voyagers from injection into the Jupiter trajectories, about one hour after launch, until the end of the mission, is conducted by the Deep Space Network (DSN).

The DSN consists of nine deep space communications stations on three continents, the Network Operations Control Center in the Mission Control and Computing Center at the Jet Propulsion Laboratory in California, and NASCOM-provided ground communications linking all locations.

Each DSN location – at Goldstone, California; Madrid, Spain; and Canberra, Australia – has one 64-meter (210-foot) diameter antenna and two 26-meter (85-foot) diameter antennas.

The three multi-station complexes are strategically located at widely separated global longitudes so that spacecraft beyond Earth orbit – and, for the Voyager mission, the planets Jupiter and Saturn – are seldom if ever out of "view" as all move through space. As the spacecraft move farther from Earth, they will always be in view, but near Earth, there is a short daily gap in Voyager 2 tracking data between the Australian and Spanish stations.

Data transmitted from the spacecraft, the downlink, is sent at S-band (2295 megaHertz) and X-band (8400 megaHertz) radio frequencies. Commands and ranging signals sent from Earth to the spacecraft, the uplink, are transmitted at S-band (2113 megaHertz) only.

DEEP SPACE NETWORK STATIONS